IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re patent application of: Roberto Pavez Aranguiz

Application No.:	10/685,613	Examiner:	CHEUNG, William K.
Filing Date:	10/15/2003	Group Art Unit:	1796
		Confirmation No.:	5097

For: Filler Containing Polymer Dispersion, Method for its Production and its Use

To: Mail Stop Appeal Brief, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

ATTENTION: Board of Patent Appeals and Interferences

AMENDED BRIEF ON APPEAL

Honorable Judges:

This is a Brief on Appeal to the Board of Appeals from an Office Action mailed on October 27, 2009 and marked final, and the subsequent Advisory Action mailed on December 31, 2009, in which the Examiner finally rejected claims 18-35 and 39-41 of the subject application. Appellants timely filed a Notice of Appeal on January 27, 2010 and herewith file this Brief in support of that Notice of Appeal.

A single copy of this Brief is being filed. Appellants previously filed and paid for a Notice of Appeal and Appeal Brief in this application and subsequently prosecution was reopened. Appellants request that the previously paid appeal fees be applied to the present filing. No fees appear necessary for this filing. Kindly charge any extension or fees required for this Appeal, or credit any fees or overpayments, to Deposit Account No. 12-2135.

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I. Real Party in Interest

The subject application is owned by Henkel AG & Co. KGaA, of Dusseldorf Germany, by change of name from Henkel Kommanditgesellschaft Auf Aktien (Henkel KGaA) and Henkel Chile S.A.[1]

II. Related Appeals and Interferences

No related appeals or interferences are known to Appellant or Appellant's legal representative.

III. Status of Claims

Claims 1-17 and 36-38 are cancelled. Claims 18-35 and 39-41 are pending in the application. Claims 18-35 and 39-41 stand finally rejected. Claims 18-35 and 39-41 are on appeal. No claims stand allowed.

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[1] Ownership of this divisional application is by virtue of an Assignment of the parent 09/869467 application (now U.S. Patent No. 6,727,305) recorded at reel 012053, frame 0403.

IV. Status of Amendments

On October 27, 2009 the Examiner finally rejected all of claims 18-35 and 39-41. No claim amendments were filed after the final rejection. All claim amendments have been entered.

V. Summary of Claimed Subject Matter

Locations in Appellant's specification referred to below are from the U.S. Publication, No. 2004/0077761. A copy of this publication is included with this brief for the Board's convenience.

Claim 18 is directed to a filler-containing polymer dispersion. The dispersion comprises water; particles of at least one filler selected from the group consisting of organic fillers, inorganic fillers and mixtures thereof [¶0021-0034], at least one water soluble organic polymer with a molecular weight of more than 600 and an HLB value of at least 15 [¶0049-0055], and particles of at least one synthetic organic polymer [¶0035-0047], polymerized in the presence of at least one type of the filler particles [¶0022], wherein the dispersion has a ratio of filler particle size to synthetic organic polymer particle size of 1.1:1 to 20:1 [¶0017; 0020;].

Claim 25 is directed to a process for the production of a filler-containing polymer dispersion, which comprises: emulsion polymerizing at least one radical-polymerizable monomer in an aqueous phase using a polymerization initiator [¶0084], the aqueous phase containing filler particles of at least one dispersed filler with a sonication is relevant to Kamiyama which uses high shear dispersion and NOT sonication. As discussed above, this combination lacks detail, enablement and motivation and fails to find all of Appellants' claimed features. Claims 25-33 and 35 are patentable for at least this reason.

e) The Board should withdraw the rejection of claims 25-33 and 35 under 35 U.S.C. §103(a) as obvious over Kamiyama in view of Hielscher.

The proposed combination fails to find all of the features of Appellants' claims 25-33 and 35. Kamiyama is not enabled for emulsion polymerization and not properly prior art with respect to emulsion polymerization methods. Kamiyama does not disclose "filler". Kamiyama does not explicitly anticipate Appellant's claimed filler particle size. Appellant submits that based on the above, the Examiner's rejection of claims 25-33 and 35 under 35 U.S.C. §103(a) cannot stand and the Board should reverse the rejection and pass this application to issue.

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Appellant's undersigned attorney may be reached by telephone, facsimile or e-mail as indicated below. All correspondence should be directed to the address given below.

Respectfully submitted,

Date: 3-29-2010

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X. Claims Appendix

1. to 17. (cancelled)

18. (previously presented) A filler-containing polymer dispersion, comprising water, particles of at least one filler selected from the group consisting of organic fillers, inorganic fillers and mixtures thereof, at least one water soluble organic polymer with a molecular weight of more than 600 and an HLB value of at least 15, and particles of at least one synthetic organic polymer, polymerized in the presence of at least one type of the filler particles, wherein the dispersion has a ratio of filler particle size to synthetic organic polymer particle size of 1.1:1 to 20:1.

19. (previously presented) The filler-containing polymer dispersion as claimed in claim 18, wherein the synthetic organic polymer particles have a diameter (d50) of 0.03 to 0.5 μm.

20. (previously presented) The filler-containing polymer dispersion as claimed in claim 18, wherein the inorganic filler comprises a member selected from the group consisting of chalk ($CaCO_3$), gypsum ($CaSO_4$) as anhydrite, hemlhydrate or dihydrate, silica flour, silica gel, titanium dioxide, talcum, a layer silicate, barium sulfate, barite and mixtures thereof and wherein the organic filler comprises a member selected from the group consisting of polyvinyl acetate, vinyl acetate copolymers, polystyrene, polyethylene, polypropylene, waxes, polybutylene, polybutadiene, copolymers of butadiene and styrene, polyacrylonitrile, resins, polyacrylate esters, polymethacrylate esters polymers containing silyl groups and mixtures thereof.

21. (previously presented) The filler-containing polymer dispersion as claimed in claim 18, wherein the at least one water-soluble polymer comprises a member selected from the group consisting of polyvinyl alcohol, cellulose ethers, carboxymethyl celluloses, hydroxyethyl celluloses, casein, potassium alginate, sodium alginate, polyurethanes and mixtures thereof.

22. (previously presented) The filler-containing polymer dispersion as claimed in claim 18, wherein the dispersion comprises at least one ionic surfactant with an HLB value of 1 to 10.

23. (previously presented) The filler-containing polymer dispersion as claimed in claim 18, wherein the dispersion comprises at least one nonionic surfactant with an HLB value of 13 to 20.

24. (previously presented) The filler-containing polymer dispersion as claimed in claim 18 comprising:

a) 10 to 70% by weight of a water-insoluble organic polymer;
b) 5 to 55% by weight of filler particles;
c) 0.02 to 1.0% by weight of a nonionic surfactant with an HLB value of 13 to 20;
d) 0.01 to 0.1% by weight of an ionic surfactant with an HLB value of 1 to 10;
e) 0.05 to 10% by weight of a water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15;
f) 24.92% to 84.89% by weight of water and
g) 0 to 30% by weight of additives.

25. (previously presented) The process for the production of a filler-containing polymer dispersion, which comprises: emulsion polymerizing at least one radical-polymerizable monomer in an aqueous phase using a polymerization initiator, the aqueous phase containing filler particles of at least one dispersed filler with a particle size (d50) of 0.01 to 0.5 µm and at least one water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15 whereby a dispersion comprising filler particles and polymer particles is formed.

26. (previously presented) The process as claimed in claim 25, wherein the aqueous phase contains an ionic surfactant.

27. (previously presented) The process as claimed in claim 25, wherein the aqueous phase contains a nonionic surfactant.

28. (previously presented) The process as claimed in claim 25, wherein the polymerization initiator is water-soluble.

29. (previously presented) The process as claimed in claim 25, wherein the process is carried out in at least two successive stages comprising:

a) a first stage comprising preparing a dispersion containing:

1) at least one ionic surfactant with an HLB value of 1 to 10 or a nonionic surfactant with an HLB value of 13 to 20 or a mixture of two or more thereof,

2) at least one inorganic filler with a particle size (d50) of 0.01 to 0.5 µm.

3) at least one polymerization initiator and

4) at least one water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15 and then heating the dispersion to a temperature of 70 to 90°C; and

b) a second stage comprising adding and polymerizing at least one radical-polymerizable monomer in the dispersion prepared in the first stage.

30. (previously presented) The process as claimed in claim 29, wherein the inorganic filler particles are added before the polymerization initiator.

31. (previously presented) The process as claimed in claim 25, wherein the filler particles dispersed in the aqueous phase are pre-emulsified with one or more monomers.

32. (previously presented) The process as claimed in claim 31, wherein the polymerization initiators are added in portions to the dispersion.

33. (previously presented) The filler-containing polymer dispersion, produced by the process claimed in claim 25.

34. (previously presented) An adhesive or surface coating composition, comprising at least one filler-containing polymer dispersion according to claim 18.

35. (previously presented) The adhesive or surface coating composition produced by the process of claim 25.

36. to 38. (cancelled)

39. (previously presented) The filler-containing polymer dispersion as claimed in Claim 18 containing at least one nonionic surfactant with an HLB of 13 to 20 and an ionic surfactant with an HLB of 1 to 10 wherein a ratio by weight of nonionic surfactant to ionic surfactant is from about 5:1 to about 1:5.

40. (previously presented) An adhesive or surface coating composition comprising: water; particles of at least one filler selected from the group consisting of organic fillers, inorganic fillers and mixtures thereof; at least one water soluble organic polymer with a molecular weight of more than 600 and an HLB value of at least 15; and synthetic organic polymer particles polymerized in the presence of at least one type of the filler particles, the synthetic organic polymer particles having a diameter (d50) of 0.03 to 0.5 µm; wherein the dispersion has a ratio of filler particle size to synthetic organic polymer particle size of 1.1:1 to 20:1.

41. (previously presented) The adhesive or surface coating composition of claim 40, wherein the inorganic filler comprises a member selected from the group consisting of $CaCO_3$, $CaSO_4$ as anhydrite, hemihydrate or dihydrate, silica flour, silica gel, titanium dioxide, talcum, barium sulfate, barite and mixtures thereof and wherein the organic filler comprises a member selected from the group consisting of polyvinyl acetate vinyl acetate copolymers, polystyrene, polyethylene, polypropylene, waxes, polybutylene,

polybutadiene, copolymers of butadiene and styrene, polyacrylonitrile, resins, polyacrylate esters, polymethacrylate esters polymers containing silyl groups and mixtures thereof.

XI. Evidence Appendix

- Copy of U.S. Patent Publication No. 2004/0077761.
- *The Condensed Chemical Dictionary,* page 987.
- *Filler Materials*, http://enwikipedia.org.wiki/Filler_(materials).
- *Westmarine,* http://westmarine.com/webapp/wcs/stores/servlet/producte/10001/-1/10001/29011?

- Copy of U.S. Patent Publication No. 2004/0077761.

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Pavez Aranguiz (43) **Pub. Date: Apr. 22, 2004**

(54) FILLER-CONTAINING POLYMER DISPERSION, METHOD FOR ITS PRODUCTION AND USE

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(57) ABSTRACT

A filler-containing an organic polymer dispersion is provided. The organic polymer of the dispersion is polymerized in the presence of particles of at least one filler. The ratio of the particle size of the filler particles to the particle size of the polymer particles is in the range of from 1.1:1 to 20:1.

FILLER-CONTAINING POLYMER DISPERSION, METHOD FOR ITS PRODUCTION AND USE

[0001] This invention relates to a filler-containing polymer dispersion which contains organic or inorganic filler particles and particles of at least one synthetic organic polymer, the ratio of the particle size of the filler particles to the particle size of the polymer particles being in the range from 1.1:1 to 20:1.

[0002] Polymer particles with a diameter of about 0.01 to about 30 μm play an important role in many areas of plastics technology. Adhesives or coating compositions containing polymer particles with diameters in this range are frequently used in particular for bonding articles or for coating surfaces. Examples of the range of applications include decorative surface coating in the form of paint coatings or other coatings and the bonding of two surfaces having identical or different properties with adhesives of the type frequently encountered in the field of bonding.

[0003] The polymer particles mentioned are generally produced by polymerization of olefinically unsaturated monomers of which the properties can be modified by the polymerization of mixtures of various monomers, for example by co- or terpolymerization. The modified properties of a single polymer particle are generally transferred as a collective property to a surface coating or bond prepared with the aid of such polymer particles. Collective properties which are often subjected to an application-related modification include, for example, hardness, elasticity and—above all in adhesive applications—bond strength, open time or early adhesion.

[0004] Certain properties of the composition used to prepare the coating or the bond, for example the surface coating composition or the adhesive, are just as important. In this connection, viscosity, flow behavior or residual monomer content are often modified in dependence upon the desired application.

[0005] Inorganic or organic fillers are often added to a surface coating composition or an adhesive containing polymer particles to modify the above-mentioned properties of a surface coating or a bond. Inorganic fillers reduce the level of organic polymer material in the coating and thus contribute to greater hardness of the coating and to protection of the environment and raw materials through a lower content of organic polymers. Organic fillers are capable of imparting certain combined properties of the filler and polymer particles present therein, for example to a polymer dispersion.

[0006] Whereas mixtures of polymer particles and fillers frequently lead to dull, rough surfaces in the field of surface coating, their effect in adhesives is often that the strength and elasticity of adhesive bonds are greatly reduced. In addition, the presence of fillers in polymer dispersions often contributes to a reduction in early adhesive strength.

[0007] Such effects are drastically noticeable above all in the field of high-quality applications of surface coatings and bonds, such as high-gloss paints and bonds in the paper or furniture industry. For example, a significant reduction in ultimate adhesive strength on wood is often observed, accompanied by reduced early adhesion.

[0008] EP-A 0 392 065 relates to polymer-coated filler particles where a filler core is coated with a membrane of a hydrophobic polymer. To produce these polymer-coated particles, a monomer is polymerized in aqueous dispersion in the presence of filler particles and an amphiphilic polymer. The document in question does not contain any teaching on the production of filler-containing polymer dispersions in which the filler particles and the polymer particles are present substantially alongside one another.

[0009] DE-OS 22 43 687 relates to an adhesive, more particularly for the production of corrugated cardboard. Although this document does describe a polymer dispersion in which polymer particles and mineral particles are present together and does indicate size ranges for the particular particles, it does not contain any teaching as to the particle size ratio along the lines of the present specification.

[0010] Accordingly, the problem addressed by the present invention was to overcome the above-mentioned disadvantages of the mixtures of polymer particles and fillers known from the prior art. More particularly, the problem addressed by the present invention was to provide a filler-containing polymer dispersion which would have the advantages of the mixtures of polymer particles and fillers known from the prior art without any of their known disadvantages.

[0011] Accordingly, a particular problem addressed by the present invention was to provide a filler-containing polymer dispersion which could be used for the production of high-quality surface coatings or bonds.

[0012] Another problem addressed by the invention was to provide a filler-containing polymer dispersion which could be used as a high-strength adhesive, particularly on wood.

[0013] A further problem addressed by the invention was to provide a filler-containing polymer dispersion with a low residual monomer content.

[0014] Yet another problem addressed by the invention was to provide an adhesive which would have an adequate open time, high early adhesion and a low viscosity coupled with excellent flow behavior.

[0015] A final problem addressed by the invention was to provide a process for the production of such filler-containing polymer dispersions.

[0016] The problems stated above are solved by a filler-containing polymer dispersion which contains organic or inorganic filler particles and particles of at least one synthetic organic polymer polymerized in the presence of the filler particles, the ratio of the particle diameter of the filler particles to the particle diameter of the polymer particles being in the range from 1.1:1 to 20:1.

[0017] Accordingly, the present invention relates to a filler-containing polymer dispersion which contains water, particles of at least one organic or at least one inorganic filler or a mixture thereof (filler particles) and particles of at least one synthetic organic polymer polymerized in the presence of filler particles of at least one type (polymer particles), characterized in that the ratio of the particle size of the filler particles to the particle size of the polymer particles is in the range from 1.1:1 to 20:1.

[0018] It has been found that surface coating compositions and surface coatings, adhesives and adhesive bonds at least comparable with filler-free coatings, but superior to the filler-containing systems known from the prior art in regard to open time, bond strength and early adhesion can be obtained using the polymer dispersions according to the invention. In addition, the filler-containing polymer dispersions according to the invention generally have a lower viscosity and better flow behavior than the system known from the prior art with comparable polymer contents and filler contents.

[0019] A process according to the invention for the production of the filler-containing polymer dispersions is also distinguished from the polymerization processes known from the prior art by the fact that it shortens the polymerization time in relation to comparable systems, provides for easier temperature control and leads to polymer dispersions with a reduced content of residual monomers in relation to polymer dispersions produced by polymerization processes known from the prior art.

[0020] Accordingly, the present invention relates to a filler-containing polymer dispersion which contains water, particles of an organic or inorganic filler (filler particles) or of a mixture of two or more organic or inorganic fillers or a mixture of two or more thereof and particles of at least one synthetic organic polymer polymerized in the presence of the filler or the fillers (polymer particles), the ratio of the particle size of the filler particles to the particle size of the polymer particles being in the range from 1.1:1 to 20:1.

[0021] Accordingly, the polymer dispersion according to the invention contains either inorganic filler particles of one type or organic filler particles of one type or inorganic filler particles of two or more different types or organic filler particles of two or more different types or organic filler particles of one type and organic filler particles of two or more different types or organic filler particles of one type and inorganic filler particles of two or more different types or inorganic filler particles of two or more different types and organic filler particles of two or more different types.

[0022] So far as organic polymer particles in the dispersion according to the invention are concerned, the organic filler particles and the (likewise organic) polymer particles differ to the extent that the organic polymer particles are formed in the presence of the filler particles, i.e. the polymerization of the polymer particles takes place in the presence of the filler particles. The effect according to the invention is obtained even when the organic filler particles and the polymer particles have substantially the same monomer composition. In one preferred embodiment of the invention, however, the organic filler particles and the polymer particles have different monomer compositions.

[0023] In the context of the invention, the term "particle size" is understood to be the "d50" value, i.e. the value at which about 50% of the particles have a smaller diameter and about 50% of the particles have a larger diameter. In principle, this value may be determined by any particle measuring techniques, for example measuring techniques based on the principle of light diffraction. The particle size data appearing in the present specification were obtained with a MASTERSIZER X from Malvern Instruments, Herrsching, Germany (version 1.2b). The mode of operation of this instrument is based on the diffraction of a light beam, the particle size being correlated with the diffraction angle.

[0024] Other techniques for determining particle sizes include, for example, granulometry in which a uniform suspension of a small quantity of the powder to be investigated is prepared in a suitable dispersion medium and is then exposed to sedimentation. The percentage distribution of the particle sizes can be estimated from the correlation between size and density of the spherical particles and their sedimentation rate as determined by Stokes' law and the sedimentation time. Other methods for determining particle size include microscopy, electron microscopy, sieve analysis, sedimentation analysis, determination of the surface density and the like.

[0025] "Polymer particles" in the context of the present invention are understood to be dispersed particles of a substantially water-insoluble synthetic organic polymer polymerized in the presence of an inorganic or organic filler particle or a mixture of two or more such filler particles, as described above.

[0026] According to the invention, suitable filler particles are any organic or inorganic particles which have a particle size (as defined above) of about 0.033 to about 10 μm, for example about 0.05 to about 5 μm or about 0.1 to about 4 μm or 0.2 to about 3 μm or about 0.5 to about 1.0 μm. According to the invention, particle size classification is based on the size of the primary particles.

[0027] A "primary particle" in the context of the present invention is understood to be a particle which is held together by primary ionic or covalent forces, for example in the form of a crystal lattice. In contrast to the primary particles, "secondary particles" are understood to be agglomerates of two or more primary particles which adhere to one another at the outer surfaces or boundaries of the primary particles under the effect of weak ionic forces or other polarity-based forces and which can be broken up into the primary particles with minimal energy, for example by simple mechanical dispersion and/or by addition of a dispersant which breaks up the particles by eliminating or reducing the weak binding forces between the primary particles.

[0028] Filler particles suitable for the purposes of the invention are, for example, inorganic materials which are inert to the at least one organic polymer and during the production of the filler-containing polymer dispersion under the prevailing reaction conditions. Examples of suitable inorganic materials are aluminium silicates, for example andalusite, sillimanite, kyanite, mullite, pyrophyllite or imogolite. Also suitable are compounds based on sodium aluminium or calcium silicates. Other suitable inorganic materials are minerals, such as silica, silica flour, silica gel, barium sulfate, metal oxides, such as zinc oxide, titanium dioxide, zeolites, kaophilite, leucite, potash feldspar, biotite, the group of soro-, cyclo-, ino-, phyllo- and tecto-silicates, the group of soluble or poorly soluble sulfates, such as gypsum, anhydrite or heavy spar, and calcium minerals, such as talcum or chalk ($CaCO_3$). The inorganic materials mentioned may be used individually, i.e. as filler particles of a single type, for the purposes of the present invention. However, a mixture of two or more types of the filler particles mentioned may equally well be used.

[0029] Other filler particles suitable for the purposes of the invention are organic filler particles in the presence of which the polymerization of the polymer particles may take place. Suitable organic filler particles are, for example, polyvinyl acetate and copolymers of polyvinyl acetate with one or more polymerizable compounds, polystyrene, polyethylene, polypropylene, waxes, such as polyethylene wax, polybutylene, polybutadiene, copolymers of butadiene and styrene, polyacrylonitrile, resins, such as rosin or hydrocarbon resins, polyacrylate esters or polymethacrylate esters with linear or branched aliphatic, aromatic or cycloaliphatic alcohols, such as methanol, ethanol, propanol, isopropanol, the isomeric butanols and higher homologs of the alcohols mentioned containing up to about 22 carbon atoms, cyclohexanol, benzyl alcohol and the like, polydialkyl maleates, such as dibutyl maleate and copolymers thereof or polymers containing silyl groups, such as polyvinyl silanes or copolymers of vinyl silane with one or more of the monomers mentioned.

[0030] In one preferred embodiment of the invention, the organic filler particles contain as organic filler filler particles containing polyvinyl acetate or copolymers of polyvinyl acetate with one or more polymerizable compounds, polystyrene, polyethylene, polypropylene, waxes, polybutylene, polybutadiene, copolymers of butadiene and styrene, polyacrylonitrile, resins, polyacrylate esters or polymethacrylate esters or polymers containing silyl groups. In another preferred embodiment, the organic filler particles consist of the polymers mentioned.

[0031] In one preferred embodiment of the invention, the filler-containing polymer dispersion contains less than five different types of filler particles, for example four, three or two different types. In another embodiment of the present invention, the polymer dispersion according to the invention contains filler particles of only one type.

[0032] The filler particles usable in accordance with the present invention may have smooth, rough or porous surfaces. In one preferred embodiment, the filler particles have a rough surface or a porous surface.

[0033] In one preferred embodiment of the invention, the filler-containing polymer dispersions according to the invention contain particles of chalk ($CaCO_3$), gypsum ($CaSO_4$) as anhydrite, hemihydrate or dihydrate, silica flour, silica gel, titanium dioxide, silica flour, talcum or a layer silicate as filler.

[0034] In another preferred embodiment of the invention, the filler-containing dispersion according to the invention contains chalk ($CaCO_3$) or gypsum ($CaSO_4$) or a mixture of filler particles containing chalk and gypsum as the filler particles. In one particularly preferred embodiment, chalk particles are present as the filler particles.

[0035] The filler-containing polymer dispersion contains polymer particles consisting of an organic polymer or of a mixture of two or more organic polymers.

[0036] Suitable organic polymers are any organic polymers obtainable by radical polymerization of olefinically unsaturated and radical-polymerizable monomers.

[0037] Olefinically unsaturated monomers accessible to emulsion polymerization are particularly suitable for the production of the polymer particles. Suitable polymers are, for example, vinyl ester polymers of which the basic monomeric unit is a vinyl ester of a linear or branched carboxylic acid containing about 2 to about 10 carbon atoms.

[0038] The vinyl ester polymers are used not only as homopolymers or copolymers of vinyl ester monomers; in another embodiment of the invention, a copolymer of vinyl acetate and ethylene (EVA copolymer) is used as the organic polymer.

[0039] Other suitable organic polymers emanate from the group of styrene/butadiene rubbers (SBRs). Rubbers such as these are produced by copolymerization of styrene and butadiene and generally contain the two monomers in a ratio by weight of about 23.5:76.5 or about 40:60. The SBRs are normally produced by emulsion polymerization in water.

[0040] Another suitable group of polymers are the polyvinyl acetates (PVAC). Polyvinyl acetates are thermoplastic polymers of vinyl acetate. The polymerization is generally carried out by suspension or emulsion polymerization.

[0041] Another suitable group of polymers are the polyethylene homo- and copolymers. A radical polymerization of ethylene is carried out, for example, in the high-pressure polymerization to LDPE under pressures of about 1,400 to 3,500 bar and at temperatures of 150 to 350° C. The reaction is initiated by oxygen or peroxides. Suitable comonomers are linear or branched α,β-unsaturated olefins.

[0042] Another group of suitable polymers are the polyacrylates or the polymethacrylates or the copolymers of acrylates and methacrylates thereof. The polymers mentioned may optionally have a free acid content which corresponds to 20-25 ml of 0.1 N KOH solution.

[0043] Another suitable polymer is polyvinylidene chloride. The polymer is preferably obtained by emulsion polymerization of 1,1-dichloroethylene. Copolymers of 1,1-dichloroethylene with acrylates, methacrylates, vinyl chloride or acrylonitrile are particularly suitable.

[0044] Another suitable polymer is polyvinylidene fluoride. This polymer may be obtained by polymerization of vinylidene fluoride and may be adapted in regard to chemical and mechanical properties, for example by copolymerization with suitable monomers, such as ethylene, acrylonitrile, acrylate esters, methacrylate esters and the like.

[0045] The polyvinyl chlorides obtainable by suspension polymerization (SPVC), micro-suspension polymerization or emulsion polymerization (EPVC) are also suitable.

[0046] According to the invention, the polymers mentioned may be present in the filler-containing polymer dispersion according to the invention both individually and in the form of mixtures of two or more thereof.

[0047] In another preferred embodiment of the invention, the filler-containing polymer dispersion contains polyvinyl acetate or polyacrylate, more particularly polybutyl acrylate, or a mixture of polyvinyl acetate and polyacrylate as polymer particles.

[0048] Depending on the properties the polymer particles are required to show and on the method used for their production, the percentage content of filler in the polymer dispersion as a whole may be between about 5 and about 55% by weight. In one preferred embodiment of the invention, the percentage content is between about 5 and about 50% by weight, for example between about 10 and about 35% by weight. In other preferred embodiment, the content of filler particles may be about 15, 20, 25 or 30% by weight or may assume an intermediate value.

[0049] The filler-containing polymer dispersion according to the invention may optionally contain at least one water-soluble organic polymer with a molecular weight of more than about 600 and an HLB value of at least 15, for example more than about 16 or more than about 17 or more than about 18. This is preferred particularly when at least partly inorganic filler particles are present as filler particles in the polymer dispersion according to the invention.

[0050] A compound suitable as a water-soluble organic polymer is, for example, polyvinyl alcohol which may be up to about 99% hydrolyzed, for example between about 70 and about 95% or between about 80 and about 88% hydrolyzed, the acetic acid groups of the chain being replaced by OH groups which are preferably distributed statistically over the entire polymer chain.

[0051] The polyvinyl alcohol preferably has a degree of polymerization of more than 100 and, more particularly, more than about 2,000. Particularly good results can be obtained, for example, with polyvinyl alcohol having a degree of polymerization of about 1,000 to about 2,000.

[0052] The polyvinyl alcohol preferably has an HLB value of at least about 19 or at least about 20, for example about 21 to about 26, for example about 22 to about 24.

[0053] Suitable polyvinyl alcohols are obtainable from Clariant, for example under the names of Mowiwol 40/88, Mowiwol 26/88, Mowiwol 8/88 or Mowiwol 4/88.

[0054] Other water-soluble organic polymers suitable for use in accordance with the invention consist, for example, of the cellulose ethers, carboxymethyl celluloses, hydroxyethyl celluloses, casein, sodium or potassium alginates, polyurethanes, etc.

[0055] In another embodiment of the invention, the ratio of the mean specific surface of organic polymers to organic or inorganic filler particles is about 5:1. The total specific surface corresponding to the inorganic fillers, based on the organic water-soluble polymers, in the dispersion according to the invention is about 5% to about 35% of the total surface of the dispersion.

[0056] In another embodiment of the invention, the fillers increase the mean total specific surface of the dispersion.

[0057] In another preferred embodiment of the invention, the filler-containing polymer dispersion contains at least one ionic surfactant with an HLB value of 1 to 10. In one preferred embodiment of the invention, the ionic surfactant has a molecular weight of less than about 600.

[0058] Anionic, cationic or ampholytic surfactants or mixtures of two or more thereof may be present. Examples of suitable anionic surfactants are alkyl sulfates, more particularly those with a chain length of about 8 to about 18 carbon atoms, alkyl and alkaryl ether sulfates containing about 8 to about 18 carbon atoms in the hydrophobic part and 1 to about 10 ethylene oxide (EO) or propylene oxide (PO) units or mixtures thereof in the hydrophilic part of the molecule, sulfonates, more particularly alkyl sulfonates, containing about 8 to about 18 carbon atoms, alkylaryl sulfonates containing about 8 to about 18 carbon atoms, taurides, esters and semiesters of sulfosuccinic acid with monohydric alcohols or alkylphenols containing 4 to about 15 carbon atoms, which may optionally be ethoxylated with 1 to about 20 EO units, alkali metal and ammonium salts of carboxylic acids, for example of fatty acids or resin acids containing about 8 to about 32 carbon atoms or mixtures thereof, phosphoric acid partial esters and alkali metal and ammonium salts thereof.

[0059] In one preferred embodiment of the invention, alkyl or alkaryl phosphates or alkyl or alkaryl sulfates containing about 8 to about 22 carbon atoms in the organic moiety, alkyl ether or alkaryl ether phosphates or alkyl ether or alkaryl ether sulfates containing about 8 to about 22 carbon atoms in the alkyl or alkaryl moiety and 1 to about 10 EO units or a mixture of two or more thereof are used as anionic surfactants.

[0060] In another preferred embodiment, an alkyl or alkaryl sulfate containing about 8 to about 22 carbon atoms in the organic moiety or an alkyl ether or alkaryl ether sulfate containing about 8 to about 22 carbon atoms in the alkyl or alkaryl moiety and 1 to about 10 EO units or a mixture of two or more thereof is used as anionic surfactant.

[0061] Examples of cationic surfactants are salts of primary, secondary or tertiary fatty amines containing about 8 to about 24 carbon atoms with acetic acid, sulfuric acid, hydrochloric acid or phosphoric acids, quaternary alkyl and alkyl benzene ammonium salts, more particularly those of which the alkyl groups contain about 6 to about 24 carbon atoms, more particularly the halides, sulfates, phosphates or acetates or mixtures of two or more thereof, alkyl pyridinium, alkyl imidazolinium or alkyl oxazolidinium salts, more particularly those of which the alkyl chain contains up to about 18 carbon atoms, for example the halides, sulfates, phosphates or acetates or mixtures of two or more thereof.

[0062] Examples of ampholytic surfactants are long-chain substituted amino acids, such as N-alkyl di(aminoethyl)glycine or N-alkyl-2-aminopropionic acid salts, betaines, such as N-(3-acylamidopropyl)-N,N-dimethyl ammonium salts with a C_{8-18} acyl group or alkyl imidazolium betaines.

[0063] In one preferred embodiment of the present invention, the following anionic surfactants are used: the alkali metal salts, more particularly the Na salt, of $C_{12/14}$ fatty alcohol ether sulfates, alkyl phenyl ether sulfates, more particularly the alkali metal or NH_4 salts thereof, Na-n-dodecyl sulfate, di-Koleic acid sulfonate (C_{18}), Na-n-alkyl-($C_{10}C_{13}$)-benzene sulfonate, Na-2-ethyl hexyl sulfate, NH_4 lauryl sulfate ($C_{8/14}$), Na lauryl sulfate ($C_{12/14}$), Na lauryl sulfate ($C_{12/16}$), Na lauryl sulfate ($C_{12/18}$), Na cetyl stearyl sulfate ($C_{16/18}$), Na oleyl cetyl sulfate ($C_{16/18}$), sulfosuccinic acid monoester disodium salt, fatty alcohol sulfosuccinate disodium salt, dialkylsulfosuccinate sodium salt or disodium sulfosuccinate or mixtures of two or more thereof.

[0064] If the polymer dispersion according to the invention contains ionic surfactants, they are present in a preferred embodiment of the invention in a quantity of up to about 1% by weight or less, for example in a quantity of up to about 0.8% by weight or about 0.5% by weight or less, based on the dispersion as a whole. Smaller quantities of ionic surfactant, for example up to about 0.2% by weight or less, for example about 0.1% by weight, 0.05% by weight or 0.02% by weight, may also be present. In another preferred embodiment of the invention, the ratio of ionic surfactant to organic water-soluble polymer is about 0.1% to about 3.0%.

[0065] In another preferred embodiment, the filler-containing polymer dispersion contains at least one nonionic surfactant with an HLB value of 13 to 20. In one preferred embodiment of the invention, the nonionic surfactant has a molecular weight of less than about 600.

[0066] Examples of nonionic surfactants are alkyl polyglycol ethers, preferably those containing about 8 to about 20 EO units and alkyl groups with about 8 to about 20 carbon atoms, alkylaryl polyglycol ethers, preferably those containing about 8 to about 40 EO units and about 8 to about 20 carbon atoms in the alkyl or aryl groups, ethylene oxide/propylene oxide (EO/PO) block copolymers, preferably those containing about 8 to about 40 EO units and the same number of PO units, addition products of alkyl amines containing alkyl groups with about 8 to about 22 carbon atoms with ethylene oxide or propylene oxide, fatty and resin acids containing about 6 to about 32 carbon atoms, alkyl polyglycosides with linear or branched, saturated or unsaturated alkyl groups containing on average about 8 to about 24 carbon atoms and an oligoglycoside group containing about 1 to about 10 hexose or pentose units on average or mixtures of two or more thereof, natural substances and derivatives thereof, such as lecithin, lanolin or sarcosine, linear organo(poly)siloxanes containing polar groups, more particularly those containing alkoxy groups with up to about 10 carbon atoms and up to about 20 EO or PO groups.

[0067] In one preferred embodiment of the invention, the polymer dispersion according to the invention contains, for example, nonyl phenol ethoxylates, octyl phenol ethoxylates, $C_{12/14}$ fatty alcohol ethoxylates, oleyl cetyl ethoxylates, $C_{16/18}$ fatty alcohol ethoxylates, cetyl stearyl ethoxylates, ethoxylated triglycerides, sorbitan monolaurate, sorbitan monooleate, sorbitan-20EO-monooleate, sorbitan-20EO-monostearate or a mixture of two or more thereof as nonionic surfactant.

[0068] If the polymer dispersion according to the invention contains nonionic surfactants, they are present in a preferred embodiment of the invention in a quantity of up to about 1% by weight or less, for example up to about 0.8% by weight or about 0.5% by weight or less, based on the dispersion as a whole. Small quantities of nonionic surfactant, for example up to about 0.2% by weight or less, for example about 0.1% by weight, 0.05% by weight or 0.02% by weight, may also be present. In another preferred embodiment, the ratio of nonionic surfactant(s) to organic water-soluble polymers (based on weight) is about 0.01 to about 1.0%. The ratio of nonionic surfactant(s) to anionic surfactant(s) (based on weight) in one preferred embodiment of the invention is about 5:1 to about 1:5, for example about 3:1 to about 1:3 or about 2:1 to about 1:2. In another preferred embodiment of the invention, the ratio by weight of nonionic surfactant to anionic surfactant is about 1.2:1 to about 1:1.2 or about 1:1.

[0069] In another preferred embodiment of the invention, the dispersion contains up to about 30% by weight, based on the dispersion as a whole, of additives. The additives include, for example, stabilizers, defoamers, antioxidants, photostabilizers, pigment dispersants, fillers, pH adjusters, plasticizers and the like.

[0070] Suitable plasticizers are, for example, esters, such as abietic acid ester, adipic acid ester, azelaic acid ester, benzoic acid ester, butyric acid ester, acetic acid ester, esters of higher fatty acids containing about 8 to about 44 carbon atoms, esters of OH-functional or epoxidized fatty acids, fatty acid esters and fats, glycolic acid esters, phosphoric acid esters, phthalic acid esters, linear or branched alcohols containing 1 to 12 carbon atoms, propionic acid esters, sebacic acid esters, sulfonic acid esters, thiobutyric acid esters, trimellitic acid esters, citric acid esters and mixtures of two or more thereof. The asymmetrical esters of dibasic aliphatic dicarboxylic acids, for example the esterification product of adipic acid monooctyl ester with 2-ethyl hexanol (Edenol DOA, a product of Henkel KGaA, Düsseldorf), are particularly suitable.

[0071] Other suitable plasticizers are the pure or mixed ethers of monohydric, linear or branched C_{4-16} alcohols or mixtures of two or more different ethers of such alcohols, for example dioctyl ethers (obtainable as Cetiol OE from Henkel KGaA, Düsseldorf).

[0072] In another preferred embodiment, end-capped polyethylene glycols, for example polyethylene or polypropylene glycol di-C_{1-4}-alkyl ethers, more particularly the dimethyl or diethyl ethers of diethylene glycol or dipropylene glycol and mixtures of two or more thereof, are used as plasticizers.

[0073] If it is to be used as an adhesive, the dispersion according to the invention may contain up to about 10% by weight of typical tackifiers. Suitable tackifiers are, for example, resins, terpene oligomers, coumarone/indene resins, aliphatic petrochemical resins and modified phenolic resins.

[0074] The dispersion according to the invention may contain up to about 2% by weight and preferably about 1% by weight of UV stabilizers. Particularly suitable UV stabilizers are the so-called hindered amine light stabilizers (HALS).

[0075] In another preferred embodiment of the invention, the filler-containing polymer dispersion contains about

[0076] 10 to 70% by weight of an organic polymer in the form of polymer particles,

[0077] 5 to 55% by weight of filler particles,

[0078] 0.05 to 0.5% by weight of a nonionic surfactant with an HLB value of 13 to 20,

[0079] 0.01 to 0.1% by weight of an ionic surfactant with an HLB value of 1 to 10,

[0080] 0.05 to 10% by weight of a water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15 where inorganic filler particles are present in the polymer dispersion,

[0081] 24.89 to 84.89% by weight of water and

[0082] 0 to 30% by weight of other additives.

[0083] If the polymer dispersion according to the invention contains only organic filler particles, a water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15 may nevertheless be present in the dispersion together with the corresponding other compounds. However, if only organic fillers are present, it is not absolutely essential to use a water-soluble organic polymer in order to obtain the effect according to the invention. If a water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15 is to be used together with an organic filler or a mixture of two or more organic fillers, the quantity of water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15 used will generally be smaller than it would for a comparable quantity of inorganic filler.

[0084] In one preferred embodiment of the present invention, the filler-containing polymer dispersion is prepared by emulsion polymerization. In the context of the present invention, "emulsion polymerization" is understood to be a polymerization process in which monomers insoluble or poorly soluble in water are emulsified in water using emulsifiers and polymerized using water-soluble initiators. Suitable emulsion polymerization processes are described, for example, in Comprehensive Polymer Chemistry, 4, 171-218, Elias (5th Edition), 2, 93 et seq; in Encyclopaedia of Polymer Science and Engineering, 12, 512 et seq and in Encyclopaedia of Polymer Science and Technology, 5, 801 et seq. Other suitable references are known, for example, from the reference books known to the expert Ullmann's Enzyklopadie der technischen Chemie, Houben-Weyl (E20, 218-268) or Kirk-Othmer. Reference is hereby expressly made to the cited literature references, the disclosures of those references being regarded as part of the disclosure of the present specification.

[0085] Whereas the filler-containing polymer dispersions known from the prior art generally involve addition of the filler to the prepared polymer dispersion, the filler particles are present in the form of their primary particles in a dispersion before the beginning of polymerization of the monomers in the case of the process according to the invention.

[0086] In one preferred embodiment of the present invention, the dispersion of the filler particles is carried out in such a way that any agglomerates of filler particles present are separated at least substantially, i.e. to a level of at least about 80 or 90% by weight, into their primary particles. This separation into the primary particles is generally promoted by the presence of emulsifiers or dispersants, as used in emulsion or suspension polymerization. However, any other form of separation of any filler particle agglomerates into the primary particles is also possible in the context of the process according to the invention, including for example ultrasonic deagglomeration, flotation or electrokinetic techniques.

[0087] According to the invention, the filler-containing polymer dispersion is prepared by emulsion polymerization. To this end, a dispersion of the filler particles in water is preferably first produced. For example, an aqueous solution of an ionic surfactant is first prepared, the ionic surfactant used preferably being the surfactant which, subsequently, is also used in the emulsion polymerization.

[0088] In another preferred embodiment of the invention, an aqueous solution of an organic water-soluble polymer with a molecular weight of at least about 600 and an HLB value of at least about 15 is first prepared.

[0089] In another preferred embodiment of the invention, an aqueous solution containing both an ionic surfactant and a water-soluble polymer with a molecular weight of at least about 600 and an HLB value of at least about 15 may also first be prepared.

[0090] After the preparation of the solutions mentioned, the dispersion of the filler particles is prepared in a preferred embodiment of the present invention. To this end, the filler particles are dispersed in one of the above-mentioned solutions, the dispersion being stirred until any filler agglomerates present have been largely dispersed. In cases of doubt, for example where a new filler on which no experimental data are available is used, the dispersion of the filler particles and the dispersion of any agglomerates present may simply be followed by several successive measurements of the particle size distribution during the dispersion process. Separation into the primary particles is achieved when the particle size distribution differs only slightly, if at all, in two successive measurements. The dispersion of the agglomerates may optionally be influenced by influencing the temperature, the stirring speed or the emulsifier or mixture of two or more emulsifiers used. The effects of the proposed measures may readily be monitored and optimized for individual cases by measurement of the particle size distribution.

[0091] When a suitable dispersion of filler particles is present, the emulsion polymerization is continued. This is done, for example, by dissolving a polymerization initiator in the dispersion, heating the dispersion to a suitable temperature and then starting the polymerization reaction by dropwise addition of monomers. However, this procedure may also be replaced by any other procedure by which the emulsion polymerization can be carried out in the filler particle dispersion.

[0092] In another preferred embodiment of the invention, a preliminary emulsion containing the monomers or the monomer mixture and the filler dispersion may also be prepared by the procedure described above. This preliminary emulsion, which may optionally contain a polymerization initiator, may be added dropwise or in portions at a temperature suitable for the polymerization reaction.

[0093] Accordingly, the present invention also relates to a process for the production of a filler-containing polymer dispersion, in which at least one radical-polymerizable monomer is subjected to emulsion polymerization in aqueous phase using a polymerization initiator, the aqueous phase containing filler particles of at least one dispersed filler with a particle size (d50) of 0.01 to 0.5 μm, at least one water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15 and at least one ionic surfactant. Suitable ionic surfactants are any of those listed in the foregoing.

[0094] In one preferred embodiment of the invention, the aqueous phase additionally contains a nonionic surfactant, suitable nonionic surfactants having already been described in the foregoing.

[0095] In another preferred embodiment of the invention, a water-soluble polymerization initiator, more particularly a peroxo compound of an organic or inorganic acid, is used in the process for producing the polymer dispersion according to the invention.

[0096] Suitable polymerization initiators are water-soluble initiators, such as tert.butyl hydroperoxide, sodium peroxodisulfate, peroxodisulfuric acid, cumene hydroperoxide, hydrogen peroxide, sodium or potassium percarbonate; azo compounds, such as diazoisobutyrodinitrile or benzoyl peroxide. Redox initiators, i.e. systems consisting of oxidizing and reducing agents, are also suitable. In many cases, water-soluble redox initiators contain transition metals, for example Fe/HO (l), although other basic components, for example the systems peroxysulfates/metabisulfates, peroxysulfates/thiosulfates or peroxides/thiosulfates, may also be used.

[0097] In one preferred embodiment of the invention, sodium persulfate, potassium persulfate or ammonium persulfate is used as the polymerization initiator.

[0098] According to the invention, the quantity of polymerization initiator used is generally between about 0.01 and about 0.5% by weight, based on the dispersion as a whole. In one preferred embodiment of the invention, the total amount of polymerization initiator used is between about 0.03 and about 0.2% by weight, for example between about 0.05 and about 0.15% by weight.

[0099] According to the invention, the total quantity of polymerization initiator may be present in the dispersion of the filler particles at the beginning of the polymerization process. In one preferred embodiment of the invention, however, the polymerization initiator is added in at least two batches at different stages of the polymerization reaction. For example, part of the total quantity of polymerization initiator may be added before the monomer(s), the remainder being added in portions or continuously during or after addition of the monomer(s).

[0100] In one preferred embodiment of the invention, the process according to the invention is carried out in at least two successive stages, a dispersion containing

[0101] a) at least one ionic surfactant with an HLB value of 1 to 10 or a nonionic surfactant with an HLB value of 13 to 20 or a mixture of two or more thereof,

[0102] b) at least one inorganic filler with a particle size (d50) of 0.01 to 0.5 μm,

[0103] c) at least one polymerization initiator and

[0104] d) at least one water-soluble organic polymer with a molecular weight of more than 200 and an HLB value of more than 15 being prepared in a first stage and then heated to a temperature of 70 to 90° C. and

[0105] e) at least one radical-polymerizable monomer

[0106] being added and polymerized in a second stage.

[0107] In another preferred embodiment of the invention, the organic or inorganic filler particles or a mixture thereof are/is added before the polymerization initiator.

[0108] In another preferred embodiment of the process according to the invention, the organic filler or the inorganic filler or a mixture thereof is present substantially in the form of its primary particles before the polymerization.

[0109] The polymerization temperature applied in the process according to the invention depends upon the choice of the monomers used and the polymerization process applied. For the monomers from the group of acrylates and vinyl acetate used in accordance with the present invention, the polymerization temperature in one preferred embodiment of the invention is in the range from about 80 to 90° C.

[0110] The present invention also relates to the use of the filler-containing polymer dispersions in lacquers, emulsion paints, glues, adhesives, surface coating compositions or other surface coatings.

[0111] Accordingly, the present invention also relates to an adhesive or a surface coating composition containing a filler-containing polymer dispersion according to the invention or produced by the process according to the invention.

[0112] The invention is illustrated by the following Examples.

EXAMPLES

[0113] Production of a filler-containing polyvinyl acetate dispersion:

[0114] 1.1 200 g of vinyl acetate monomer were introduced into a monomer container.

[0115] 1.2 Preparation of the catalyst solution

[0116] 1.0 g of ammonium persulfate were dissolved in 3.0 g of water in a clean plastic container.

[0117] 1.3 Preparation of a premix

[0118] 592.3 g of water and 32.7 g of Vinol V-205 (manufacturer: Air Products, Kentucky) were introduced into a clean container. The mixture was stirred and then heated to about 85-90° C., followed by stirring until the components had completely dissolved (about 2 hours). The solution was then cooled.

[0119] 1.4 0.37 g of sodium lauryl ether sulfate and 0.12 g of Tergitol 15S9 (manufacturer: Union Carbide Chemicals and Elastics (Europe) S.A.) were added. The mixture was homogenized for a few minutes, after which 100 g of chalk were added, the mixture being stirred for about 30 minutes in order to break up the chalk into its primary particles.

[0120] 1.5 0.09 g of defoamer was added to this dispersion.

[0121] 1.6 Polymerization:

[0122] The premix was then heated to 80° C. and 90% of the catalyst solution was added. The mixture was homogenized by stirring for 5 minutes.

[0123] 1.7 The vinyl acetate monomer was then added and the polymerization process was started and lasted about 3.5 to 4.0 hours.

[0124] 1.8 After the end product had been obtained, its physicochemical parameters and end use were investigated.

[0125] 2. Residual monomer content:

[0126] A dispersion according to the invention was compared with a dispersion obtained simply by mixing a polyvinyl acetate dispersion with chalk. The two dispersions were otherwise identical in their composition. Both dispersions were gas-chromatographically analyzed for monomeric vinyl acetate. The investigations were carried out both by extraction and by the "head space method". The results are set out in Table 1.

TABLE 1

	Vinyl acetate content	
Sample	Head space	Extraction
Comparison Example	551 ppm	872
Invention	28	27

3. FORMULATION EXAMPLES

[0127] Some Formulation Examples are set out in Table 2 below. The quantities shown represent units by weight.

TABLE 2

Constituent	Example 1	Example 2	Example 3
Water	450	450	582
SK1	—	—	14
SK2	23.5	23.5	36
SK3	23.5	23.5	—
Nonionic surfactant	0.4	0.4	0.4
Anionic surfactant	0.4	0.4	0.4
Defoamer	0.2	0.2	0.2
Titanium dioxide	—	—	90
Chalk	110	165	—
Vinyl acetate	390	335	260
Ammonium persulfate	1.3	1.3	1.3
Total	999.3	999.3	984.3
Solids content	55.33%	55.84%	41.32
pH value	6.5	6.65	—
Viscosity (5/2/20) cps	38,000	38,000	83,000

[0128] SK1=polyvinyl alcohol, partly saponified, degree of hydrolysis 87.2-88.8%, acetyl content 10-11.4%, degree of polymerization 900, viscosity 3.5-4.5 mPas (4% solution in water)

[0129] SK2=polyvinyl alcohol, partly saponified, degree of hydrolysis 86.7-88.7%, acetyl content 10-11.4%, ester value 130-150, pH 4.5-7 (4% solution in water), viscosity 24.5-27.5 mPas (4% solution in water)

[0130] SK3=polyvinyl alcohol, partly saponified, degree of hydrolysis 87.2-88.8%, acetyl content 10-11.4%, degree of polymerization 900, viscosity 3.5-4.5 mPas (4% solution in water)

[0131] Nonionic surfactant=C_{11-15} alcohol+9 EO

[0132] Anionic surfactant=C_{12-14} fatty alcohol+2 EO sulfate sodium salt

[0133] Defoamer=mixture of hydrocarbons and nonionic surfactants

1. A filler-containing polymer dispersion which contains water, particles of at least one organic or at least one inorganic filler or a mixture thereof (filler particles) and particles of at least one synthetic organic polymer polymerized in the presence of filler particles of at least one type (polymer particles), characterized in that the ratio of the particle size of the filler particles to the particle size of the polymer particles is in the range from 1.1:1 to 20:1.

2. A filler-containing polymer dispersion as claimed in claim 1, characterized in that the polymer particles have a diameter (d50) of 0.03 to 0.5 μm.

3. A filler-containing polymer dispersion as claimed in claim 1 or 2, characterized in that chalk ($CaCO_3$), gypsum ($CaSO_4$) as anhydrite, hemihydrate or dihydrate, silica flour, silica gel, titanium dioxide, talcum, a layer silicate, barium sulfate or barite is present as the inorganic filler.

4. A filler-containing polymer dispersion as claimed in any of claims 1 to 3, characterized in that filler particles containing polyvinyl acetate or copolymers of polyvinyl acetate with one or more polymerizable compounds, polystyrene, polyethylene, polypropylene, waxes, polybutylene, polybutadiene, copolymers of butadiene and styrene, polyacrylonitrile, resins, polyacrylate esters or polymethacrylate esters or polymers containing silyl groups are present as the organic filler.

4. A filler-containing polymer dispersion as claimed in any of claims 1 to 3, characterized in that at least one water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of at least 15 is present.

5. A filler-containing polymer dispersion as claimed in any of claims 1 to 4, characterized in that at least one ionic surfactant with an HLB value of 1 to 10 is present.

6. A filler-containing polymer dispersion as claimed in any of claims 1 to 5, characterized in that at least one nonionic surfactant with an HLB value of 13 to 20 is present.

7. A filler-containing polymer dispersion as claimed in any of claims 1 to 6, characterized in that it contains

10 to 70% by weight of a water-insoluble organic polymer,

5 to 55% by weight of filler particles,

0.05 to 0.5% by weight of a nonionic surfactant with an HLB value of 13 to 20,

0.01 to 0.1% by weight of an ionic surfactant with an HLB value of 1 to 10,

0.05 to 10% by weight of a water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15,

24.89 to 84.89% by weight of water and

0 to 30% by weight of other additives.

8. A process for the production of a filler-containing polymer dispersion, characterized in that at least one radical-polymerizable monomer is subjected to emulsion polymerization in aqueous phase using a polymerization initiator, the aqueous phase containing filler particles of at least one dispersed filler with a particle size (d50) of 0.01 to 0.5 μm, at least one water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15.

9. A process as claimed in claim 8, characterized in that the aqueous phase contains an ionic surfactant.

10. A process as claimed in claim 8 or 9, characterized in that the aqueous phase contains a nonionic surfactant.

11. A process as claimed in any of claims 8 to 10, characterized in that a water-soluble polymerization initiator is used.

12. A process as claimed in any of claims 8 to 11, characterized in that it is carried out in at least two successive stages, a dispersion containing

f) at least one ionic surfactant with an HLB value of 1 to 10 or a nonionic surfactant with an HLB value of 13 to 20 or a mixture of two or more thereof,

g) at least one inorganic filler with a particle size (d50) of 0.01 to 0.5 μm.

h) at least one polymerization initiator and

i) at least one water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15 being prepared in a first stage and then heated to a temperature of 70 to 90° C. and

j) at least one radical-polymerizable monomer

being added and polymerized in a second stage.

13. A process as claimed in claim 12, characterized in that the inorganic filler particles are added before the polymerization initiator.

14. A process as claimed in claim 8, characterized in that the filler particles dispersed in the aqueous phase are pre-emulsified with one or more monomers.

15. A process as claimed in claim 14, characterized in that polymerization initiators are added in portions to the preliminary emulsion.

16. A filler-containing polymer dispersion, characterized in that it is produced by the process claimed in any of claims 8 to 15.

17. An adhesive or surface coating composition, characterized in that it contains at least one filler-containing polymer dispersion according to any of claims 1 to 7 or 16 or a filler-containing polymer dispersion produced by the process claimed in any of claims 8 to 15.

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- *The Condensed Chemical Dictionary,* page 987.

The
Condensed Chemical Dictionary

TENTH EDITION

Revised by

GESSNER G. HAWLEY

VAN NOSTRAND REINHOLD COMPANY
NEW YORK CINCINNATI ATLANTA DALLAS SAN FRANCISCO
LONDON TORONTO MELBOURNE

hat is, the boundary between the
nvironment, the larger the surface
ubstance the more reactive it be-
ction to small particles is a means
efficiency of both chemical and
s; for example, the coloring effect
creased by maximum size reduc-
ck is notable among solids for its
(as much as 18 acres a pound for
activity of its surface accounts for
bility to increase the strength and
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dsorb molecules of gases is due to
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adsorption techniques.

The observation and measure-
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surface tension of liquids (vapor
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tion and metabolic mechanisms in
ls. Surface chemistry has many
tions, a few of which are air pollu-
nthetic detergents; reinforcement
stics; behavior of catalysts; color
rties of paints; aerosol sprays of all
and thin films, both metallic and
ling names in the development of
raham, Freundlich and W. Ost-
century, and Harkins, Langmuir,
lain in the 20th. See also colloid

any liquid, the attractive force
olecules below the surface upon
e/air interface, resulting from the
ncentration of a liquid compared
ular concentration of a gas. An
nternal pressure, is thus created
strain the liquid from flowing. Its
th the chemical nature of the liq-
have high surface tension (wa-
n at 20°C); nonpolar liquids have
s (benzene = 29 dynes/cm, ethyl
ynes/cm); thus they flow more
r. Mercury, with the highest sur-
y liquid, (480 dynes/cm), does not
rates into droplets. See also inter-
e agent.

face-active agent.

demark for a series of castor oil-
surfactants.
defoamers; plasticizers; solubi-
s; lubricants; in emulsion paints,
ns, cosmetics and polishes.

nark for a series of bactericides
rs. "Surflo-B11" is a film-forming amine that acts as a corrosion inhibitor and bactericide in low pH water-base drilling muds. "Surflo-B33" is a bactericide for treating water-base packer fluids or oil field waters.

"Surfonic."[137] Trademark for a series of nonionic, biodegradable, surface-active agents, described as alkoxy-polyethoxy-ethanols, the ethylene oxide adducts of primary or straight-chain alcohols.
Uses: Wetting agent; detergent; emulsifier; biodegradable intermediate for sulfation purposes.

"Surfpac."[233] Trademark for biological oxidation media, based on saran; used in aerobic treatment of wastewaters.

"Surfy-nol."[144] Trademark for a group of organic surface-active agents.
Properties: Acetylenic alcohols or glycols or their ethoxylated derivatives; waxy or powdered solids, or liquids; nonfoaming, nonionic. For example, "Surfy-nol" 61 is 3,5-dimethyl-1-hexyne-3-ol.
Containers: 55-gal phosphatized steel drums, except 82 grade (44-gal fiber drum), 5-gal and 1-gal cans.
Uses: Wetting and foam suppression; rinsing aids; viscosity reduction; detergent formulations; penetrating agents.

"Surlyn."[28] Trademark for a group of ionomer resins (q.v.).
Properties: ("Surlyn" A): Thermoplastic produced as a granular material; flexible, transparent, grease-resistant; very light-weight but tough. Izod impact strength 5.7–14.6 ft-lb/in (higher than any other polyolefin); tensile strength 3,500-5,500 psi; elongation 300–400%; softening point 71°C. Insoluble in any commercial solvent; subject to slow swelling by hydrocarbons, to slow attack by acids.
Uses: Coatings; packaging films; products made by injection or blow molding, or by thermoforming.

SUS. Abbreviation for Saybolt Universal seconds. See Saybolt Universal viscosity.

suspension. A system in which very small particles (solid, semisolid, or liquid) are more or less uniformly dispersed in a liquid or gaseous medium. If the particles are small enough to pass through filter membranes, the system is a colloidal suspension (or solution). Examples of solid-in-liquid suspensions are comminuted wood pulp in water, which becomes paper on filtration; the fat particles in milk; and the red corpuscles in blood. A liquid-in-gas suspension is represented by fog or by an aerosol spray. If the particles are larger than colloidal dimensions they will tend to precipitate, if heavier than the suspending medium, or to agglomerate and rise to the surface, if lighter. This can be prevented by incorporation of protective colloids. Polymerization is often carried out in suspension, the product being in the form of spheres or beads. See also solution, colloidal; dispersion; emulsion; colloid chemistry.

"Sustane."[416,505] Trademark for a group of nontoxic formulations based on butylated hydroxyanisole.
Forms available: 3 and 6, liquid formulations; BHA, white tablets; E, water emulsifiable formulation; 1-F and 3-F, flakes.
Uses: Antioxidants for food products, especially animal fats and vegetable oils; in cooked food products such as potato chips, baked goods, nuts, etc.; stabilizer for petroleum wax coatings for food packaging; petroleum products.

sweeten. (1) To add sugar or a synthetic product to foods or beverages to provide a sweet taste (see flavor). (2) To deodorize and purify petroleum products by removing sulfur compounds (see doctor treatment). (3) In industrial slang, to increase the quality of a low-cost product by adding more expensive ingredients.

sweetener, nonnutritive. A food additive, either natural or synthetic, usually having much greater sweetness intensity than sugar (sucrose), but without its caloric value. In some cases they act as enhancers or potentiators of sweetness. Chief among them is saccharin, a benzoic acid derivative. The cyclamate group was removed from the market by FDA in 1970 because of animal carcinogenicity, though the evidence in respect to human toxicity is controversial. Efforts to change this ruling have been unsuccessful.

Increasing research in the last decade has developed several new noncaloric sweeteners: the dihydrochalcone group of disaccharides; glycyrrhizin (licorice extract), especially its ammoniated derivative; aspartame ($C_{14}H_{18}N_2O_5$), dulcin (4-ethoxyphenylurea), and the glycoprotein "miracle fruit". None of the latter group has been fully approved.

sweet oil. See olive oil.

sweet water. (1) The glycerin and water mixture obtained when fats are split (or hydrolyzed) with water to give fatty acid and glycerin. (2) The washings from char used in sugar refining. (3) In engineering terminology, plain water cooled to just above the freezing point and used to preserve milk and other food products.

swep. Generic name for methyl 3,4-dichlorocarbanilate (methyl N-3,4-dichlorophenylcarbamate) $CH_3OOCNHC_6H_3Cl_2$.
Properties: Crystals; m.p. 113°C. Insoluble in water and kerosine; soluble in acetone and dimethylformamide.
Hazard: Toxic by ingestion.
Use: Herbicide.

"Sylfat."[296] Trademark for high-purity tall oil fatty acids used in protective coatings, soaps, detergents, disinfectants, intermediates, and flotation chemicals.

"Sylgard."[149] Trademark for a series of silicone resin encapsulants used in electronic assemblies.

"Sylkyd."[149] Trademark for organosiloxy compositions for use as intermediates in the production of

- *Filler Materials*, http://enwikipedia.org.wiki/Filler_(materials).

Filler (materials)

From Wikipedia, the free encyclopedia

Fillers are particles added to material (plastics, Composite material, Concrete) to lower the consumption of more expensive binder material or to better some properties of the mixtured material. Worldwide more than 50 million tons of fillers with a total sum of ca. 25 billion Euro for different application areas, such as paper, plastics, rubber, paints and adhesives, are consumed annually. As such, fillers, produced by more than 700 companies, rank among the world's major raw materials and are contained in a variety of goods for daily consumer needs.

Formerly, fillers were used predominantly to cheapen end products. Today, it has been proven that fillers are also able to enhance technical properties of the products. As a result, a number of optimized types of fillers, nano-fillers or surface treated goods have been developed.

Among the 20 most important fillers, calcium carbonate holds the largest market volume and is mainly used in the paper industry and increasingly in the plastics sector. While formerly ground calcium carbonate was used, today precipitated calcium carbonate which is manufactured with the natural mineral is increasingly applied to enhance technical properties of the end product.

References

Retrieved from "http://en.wikipedia.org/wiki/Filler_(materials)"
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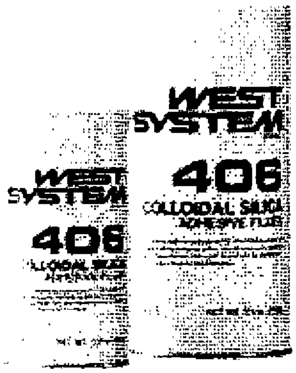

WEST SYSTEM

#406 Colloidal Silica

004_120_004_014

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406 Colloidal Silica Filler - 1.7 OZ	318402	406-2	Only $10.49 USD	I
406 Colloidal Silica Filler - 6 OZ	323618	406-7	Only $22.99 USD	I

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Overview

406 Colloidal Silica is a thickening additive used to control the viscosity of the epoxy and prevent epoxy runoff in vertical and overhead joints. 406 is a very strong filler that creates a smooth mixture, ideal for general bonding and filleting. It is also our most versatile filler. Often used in combination with other fillers, it can be used to improve the improve strength, abrasion resistance, and consistency of fairing compounds, resulting in a tougher, smoother surface. Color: off-white.

XII. Related Proceedings Appendix

None.

particle size (d50) [¶0023] of 0.01 to 0.5 µm and at least one water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15 [¶0093] whereby a dispersion comprising filler particles and polymer particles is formed.

Claim 33 is directed to a filler-containing polymer dispersion, produced by the process claimed in claim 25. The Board's attention is directed to Appellants' Examples starting in ¶0113.

Claim 34 is directed to an adhesive or surface coating composition, comprising at least one filler-containing polymer dispersion according to claim 18. The Board's attention is directed to paragraphs ¶0073, 0110 and 0111.

Claim 35 is directed to an adhesive or surface coating composition produced by the process of claim 25. The Board's attention is directed to paragraphs ¶0073, 0110 and 0111.

Claim 40 is directed to an adhesive or surface coating composition comprising: water; particles of at least one filler selected from the group consisting of organic fillers, inorganic fillers and mixtures thereof [¶0021 - 0034]; at least one water soluble organic polymer with a molecular weight of more than 600 and an HLB value of at least 15 [¶0049 - 0055]; and synthetic organic polymer particles polymerized in the presence of at least one type of the filler particles [¶0035 - 0047], the synthetic organic polymer particles having a diameter (d50) [¶0023] of 0.03 to 0.5 µm [original claim 2];

wherein the dispersion has a ratio of filler particle size to synthetic organic polymer particle size of 1.1:1 to 20:1 [¶0017; 0020;].

VI. Grounds of Rejection to be Reviewed on Appeal

Whether claims 18-24, 34 and 39-41 are patentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,140,394 to Kamiyama et al. ("Kamiyama") in view of the product literature of Hielscher-Ultrasound Technology ("Hielscher").

Whether claims 19 and 40 are patentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,140,394 to Kamiyama et al. in view of the product literature of Hielscher-Ultrasound Technology.

Whether claims 24 and 38 are patentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,140,394 to Kamiyama et al. in view of the product literature of Hielscher-Ultrasound Technology.

Whether claims 25-33 and 35 are patentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,140,394 to Kamiyama et al. in view of the product literature of Hielscher-Ultrasound Technology.

VII. Argument

1) U.S. Patent No. 6,140,394 to Kamiyama et al.

Kamiyama is directed to a method of producing polymer particles by suspension polymerization. Kamiyama repeatedly limits the disclosure to suspension polymerization. See, for example:

- METHOD AND APPARATUS OF SUSPENSION POLYMERIZATION (Title).

- A method of suspension polymerization . . . (Abstract).
- More particularly, the present invention relates to . . . suspension polymerization. (Column 1, lines 13-16).
- An object of the invention is to provide a method of suspension polymerization. (Column 2, lines 25-29).
- The present invention relates generally to a method of suspension polymerization . . . (column 2, lines 36-49).
- The method of another aspect of the invention relates to suspension polymerization . . . (Column 4, lines 57-60).
- The method of suspension polymerization of the present invention . . . (Column 5, lines 43-45).
- Examples 1 and 2 illustrating suspension polymerization.
- A method of suspension polymerization (Claim 1).
- Kamiyama teaches that emulsion polymerization as a method has defects (column 1, lines 31-42). Kamiyama distinguishes emulsion polymerization from suspension polymerization and states that the claimed suspension polymerization method solves the problems encountered with emulsion polymerization (column 2, lines 33-36).

Kamiyama discloses that the polymer particles therein can be within the range of 5-50 micrometers (column 1, line 15) or 2-30 micrometers (column 6, lines 11-16).

The only use of the word "filler" in Kamiyama (column 1, line 12 and line 24) is to describe the formed polymer product as "functional fillers". Kamiyama does not use the word "filler" to refer to a filler particle in the product. Kamiyama discloses the use of suspension stabilizers at column 6, lines 27-50. This teaching is generally directed to organic suspension stabilizers. Kamiyama briefly discloses inorganic powder suspension stabilizers at column 6, lines 43-45 stating: "Inorganic powders such as calcium phosphate powder and fine silica powder are also often used as suspension stabilizers." The suspension stabilizers in Kamiyama do not appear to be dispersed because the recited calcium phosphate is dissolved (see Example 2) and the recited silica "covers the surface of the polymer droplet (column 6, lines 45-46).

There is no disclosure of particular inorganic particle sizes. There is no disclosure of ratio of inorganic particle size to polymer particle size. There is no disclosure of any reason to use a particular ratio of inorganic particle size to polymer particle size.

2) The rejection of claims 18-24, 34 and 39-41 under 35 U.S.C. §103(a).

Claims 18-24, 34 and 39-41 are rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 6,140,394 to Kamiyama et al. ("Kamiyama") as affirmed in product literature of Hielscher-Ultrasound Technology, (http://www.hielscher.com/ultrasonics/size_reduction_silica_01.htm) ("Hielscher").

The Office[2] admits that Kamiyama does not disclose filler particle size or ratio of filler particle size to synthetic organic polymer particle size. The Office goes on to assert:

> However, a product literature of Hielscher-Ultrasound Technology, disclose standard silica that can have particle sizes range from 2 microns to 600 microns, with median particle size of about 250 microns. Since the product literature (abstract) clearly teach that the disclosed silica can be dispersed to form a

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[2] 10/27/2009 Office Action, pages 3-4

> dispersion with improved dispersion properties, it would have been obvious to one skilled in the art to incorporate the particle size teachings of the product literature into Kamiyama et al. In view of the particle sizes as taught in the product literature and the particle size as taught in Kamiyama et al. (Fig. 3-6), the examiner has a reasonable basis that the claimed ratios have been met by Kamiyama et al. in view of the product literature of Hielscher.

a) The proposed combination does not teach or suggest Appellants' claimed composition comprising both filler particles and water soluble organic polymer.

A prior art reference or combined references must teach or suggest all of the limitations of a claim to be prior art under §103. In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970). When even one claim limitation is not found in the combination of prior art, a rejection under 35 U.S.C. §103 is improper. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Pending claim 18 recites, with underlining added:

> A filler-containing polymer dispersion, comprising water, particles of at least one filler selected from the group consisting of organic fillers, inorganic fillers and mixtures thereof, at least one water soluble organic polymer with a molecular weight of more than 600 and an HLB value of at least 15, and particles of at least one synthetic organic polymer, polymerized in the presence of at least one type of the filler particles, wherein the dispersion has a ratio of filler particle size to synthetic organic polymer particle size of 1.1:1 to 20:1.

Thus, claim 18 recites BOTH particles of at least one filler AND particles of at least one water soluble organic polymer.

The rejection does not explicitly indicate which components of Kamiyama are asserted against which features of claim 18. As best understood, Appellants' water soluble organic polymer is asserted to be the polyvinyl alcohol disclosed at Kamiyama column 6, lines 39-43. Appellants' particles of at least one filler is asserted to be the calcium phosphate or silica powder disclosed at Kamiyama column 6, lines 43-45.

Both polyvinyl alcohol and calcium phosphate or silica powder are disclosed by Kamiyama (column 6, lines 27-50) to be "Suspension Stabilizer". There is no disclosure that BOTH polyvinyl alcohol and calcium phosphate or silica powder are used at the same time. There are no Examples in Kamiyama illustrating use of silica powder. Thus, this rejection "double books" one material from Kamiyama (the suspension stabilizer) to be two of Appellants' recited claim features. Kamiyama does not teach or suggest use of both polyvinyl alcohol and silica powder as asserted in the rejection. Claims 18-24, 34 and 39-41 are patentable for at least this reason.

b) The proposed combination does not disclose "filler".

A suspension stabilizer is a material such as a protective colloid that inhibits agglomeration of particles. See attached page 987 from The Condensed Chemical Dictionary[3]. A filler is a material added in large quantities to displace a more expensive material in a composition or change properties of the composition. See attached page from http://en.wikipedia.org/wiki/Filler_(materials).[4]

Kamiyama fails to disclose "filler" in that composition. The only reference to "filler" in Kamiyama (column 1, line 12 and line 24) is to uses for the formed polymer particles, e.g. the polymer particles formed by the Kayama process ca be used as a filler. The text of Kamiyama cited in the rejection as disclosing fillers is limited to suspension stabilizers. As taught by Kamiyama at column 6, lines 43-47: "Inorganic powders such as calcium phosphate powder and a fine silica powder are also often used as suspension stabilizers. These suspension stabilizers cover the surfaces of droplets so that they will not coalesce or agglomerate during polymerization." Kamiyama's use of silica as a suspension stabilizer is in agreement with the use of that term in the art and contrary to use as a filler as understood in the art.

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[3] Filed with Appellants' 6/30/2009 Response.

[4] Filed with Appellants' 6/30/2009 Response.

Hielscher Technology discloses use of silica as a multi-functional ceramic material that can be used for different purposes in paint, plastics, adhesives, insulation and concrete. There is no teaching in Hielscher Technology that silica is useful as filler, or might be useful as filler, in the Kamiyama composition.

The Office asserts:[5] "Although Kamiyama et al. fail to label the inorganic powder as filler, it is still filler because the inorganic powder remains in the final prepared dispersion composition." The Office assertion completely ignores 1) the explicit teaching of Kamiyama that the silica covers the surface of the polymer droplet to act as a suspension stabilizer; 2) the definition of filler as used in the chemical arts; and 3) the undesirable thickening effect that would occur in the Kamiyama composition if silica was used as filler.[6] Kamiyama knows what filler is (see the disclosure therein at column 1, lines 12 and 24) and clearly teaches that silica in that composition is NOT filler. Claims 18-24, 34 and 39-41 are patentable for at least this reason.

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[5] 10/27/2009 Office Action, page 3.

[6] Kamiyama teaches at column 6, lines 17-23 that increasing composition viscosity will undesirably lead to particle size growth or gelling. Suspension stabilizers are used to prevent these undesirable effects. As discussed in more detail below, silica used as a filler in the manner proposed in the rejection would undesirably thicken the Kamiyama composition.

c) Even if the Kamiyama suspension stabilizer is wrongly considered to be a filler the proposed combination does not necessarily teach or suggest Appellants' claimed ratio of inorganic particle size to polymer size.

Arguendo, if the inorganic suspension stabilizer of Kamiyama can be considered filler (which Appellants dispute), then there is no teaching or suggestion in the proposed combination that would necessarily lead to Appellants' claimed ratio of inorganic particle size to polymer particle size.

i) The proposed combination does not explicitly disclose a ratio of inorganic particle size to polymer size.

The Office admits[7] that Kamiyama fails to explicitly disclose suspension stabilizer particle size and any ratio of inorganic particle size to polymer particle size. A ratio of inorganic particle size to polymer particle size may exist in the Kamiyama reference. However, it is simply not possible to discern that ratio from the Kamiyama reference because *it never provides any size for the inorganic particles!* The fact that the inorganic particle size *can* be measured does not change the fact that *it never was measured.* Hielscher Technology does not disclose any ratio of inorganic particle size to polymer particle size.

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[7] 10/27/2009 Office Action, page 3.

ii) The proposed combination does not inherently disclose a ratio of inorganic particle size to polymer size.

The express, implicit, and inherent disclosures of a prior art reference may be relied upon in the rejection of claims under 35 U.S.C. §102. See MPEP §2112. However, "[t]he doctrine of inherency is available only when the prior inherent event can be established as a certainty. That an event may result from a given set of circumstances is not sufficient to establish anticipation. Probabilities are not sufficient . . . A prior inherent event cannot be established based upon speculation . . ." Ethyl Molded Products Co. v. Betts Package Inc., 9 USPQ2d 1001, 1032-1033 (E.D. Ky. 1988). The Court of Appeals for the Federal Circuit has reinforced this position stating: "[t]he fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic." In re Rijckaert, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993). To rely on the theory of inherency in rejecting a claim under 35 U.S.C. §§102 or 103, ". . . the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original).

Further, the chemical arts are known to be unpredictable so that a person of ordinary skill is cautious about extrapolating from teachings within those arts. See, for example, In re Marzocchi, 169 USPQ 367, 368-370 (CCPA 1971); In re Soni, 54 F.3d 746, 750 (Fed. Cir. 1995); and Eisai Co. v. Dr. Reddy's Labs., Ltd, 533 F.3d 1353, 1359 (Fed. Cir. 2008). This caution in extrapolating from chemical teachings is especially true in the present case as Kamiyama teaches use of a different polymerization process; does not disclose use of filler in the composition therein; does not disclose any particular inorganic particle size; does not disclose any necessary or useful ratio of inorganic particle size to polymer particle size; does not disclose any reason to use a particular ratio of inorganic particle size to polymer particle size; and uses a different dispersion process than Hielscher Technology.

(1) The Hielscher Technology graph referred to on page 4 of the Office Action is NOT relevant to suspension stabilizers or to shear mixing as used in Kamiyama.

Hielscher Technology explicitly teaches on page 1, with bracketed text added, that "Ultrasonic processing has been proven to be more effective in dispersing of silica than other high-shear mixing methods. The picture below [graph referred to on page 4 of the Office Action] shows a typical result of ultrasonic dispersing of fumed silica in water."

The Hielscher Technology graph referred to in the Office Action is for a dispersion of an unknown amount of fumed silica in water.

The Hielscher Technology graph referred to in the Office Action is the result of an ultrasonic dispersion method and NOT for the high shear mixing method used in Kamiyama.

The Hielscher Technology graph referred to in the Office Action is NOT relevant to suspension stabilizers such as used in Kamiyama.

In the 12/31/2009 Advisory Action the Office admits that Hielscher teaches particle sizes "after sonication". The Office does not discuss how results obtained from sonication are relevant to the different high shear mixing method which is the point of Kamiyama.

(2) The proposed combination provides a huge range of theoretically possible ratios for filler particle size to polymer particle size.

On 11/16/2007 the Office asserted[8]:

> Appellants must recognize that the silica powder (col. 6, line 43-45) and polymer particle (col. 1, line 15-16; col. 6, line 11-12, 15) as taught in Kamiyama et al. clearly have sizes that are measurable in micron size ranges, it would not be difficult to one of ordinary skill in art that [sic] there is a ratio exist between the two filler materials or other ingredients. As affirmed in the product literature of Hielscher - Ultrasound Technology, standard silica can have particle sizes range from 2 microns to 600 microns, . . .

On 10/27/2009 the Office asserted[9]:

> However, a product literature of Hielscher-Ultrasound Technology, disclose standard silica that can have particle sizes range from 2 microns to 600 microns . . .

In the 12/31/2009 Advisory Action, the Office now asserts:

> Regarding the claimed filler to polymer ratio, Appellants must recognize that Hielscher (page 2) clearly teach a silica distribution after sonication having particle sizes mostly between 0.1 to 1 micron (the whole range ranges from 0.1 to 100 microns).

Kamiyama discloses polymer particle sizes within the range of 5 to 50 micrometers (column 1, line 15) or 2 to 30 micrometers (column 6, lines 11-15). Hielscher Technology discloses that fumed silica particles dispersed in water can have a particle size of <0.2 micrometers to >600 micrometers. The previously submitted

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[8] 11/16/2007 Office Action, page 4.
[9] 10/27/2009 Office Action, page 4.

CAB-O-SIL M-5P literature[10] discloses that some forms of silica can have an average particle length of 0.2-0.3 microns. Using these particle sizes it is theoretically possible to have a ratio of inorganic particle size to polymer particle size ranging from:

inorganic particle size	**polymer particle size**	**ratio inorganic particle size : polymer particle size**
0.2 micrometers	2 micrometers	0.2:2 or 0.1:1
600 micrometers	2 micrometers	600:2 or 300:1
0.2 micrometers	50 micrometers	0.2:50 or 0.004:1
600 micrometers	50 micrometers	600:50 or 12:1

Thus, the cited art provides a theoretically possible range of ratios for inorganic particle size to polymer particle size from 0.004:1 to 300:1; spanning almost five (5) orders of magnitude!

(3) Kamiyama does not disclose any reason to narrow the huge range of theoretically possible ratios for filler particle size to polymer particle size.

- Kamiyama does NOT use filler particles.
- Kamiyama does NOT describe any particular size for inorganic particles.
- Kamiyama does NOT disclose any reason to use a particular inorganic particle size.
- Kamiyama does NOT disclose any particular ratio of inorganic particle size to polymer particle size.
- Kamiyama does NOT disclose any reason to use a particular range of ratios of inorganic particle size to polymer particle size.

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[10] Submitted in a Form 1449 on October 5, 2006.

(4) Hielscher Technology does not disclose any reason to narrow the huge range of theoretically possible ratios for filler particle size to polymer particle size.

- There is no teaching in Hielscher Technology of polymeric particles.
- There is no teaching in Hielscher Technology of suspension stabilizers.
- There is no teaching in Hielscher Technology that silica is useful as filler, or might be useful as filler, in the Kamiyama composition.
- There is no teaching in Hielscher Technology of any ratio of inorganic particle size to polymer particle size within any composition.
- There is no teaching in Hielscher Technology of silica particle size resulting from high shear mixing such as taught in Kamiyama.

(5) Appellant claims only a very narrow range of ratios for filler particle size to polymer particle size.

Pending claim 18 recites in one pertinent part: ". . . wherein the dispersion has a ratio of filler particle size to synthetic organic polymer particle size of 1.1:1 to 20:1."

(6) There is no teaching or suggestion in the proposed combination that the ratio for inorganic particle size to polymer particle size MUST fall within Appellant's claimed range.

There is no teaching or suggestion in either cited reference to use any particular ratio for inorganic particle size to polymer particle size. Given the huge, theoretically possible range of ratios for inorganic particle size to polymer particle size (0.004:1 to 300:1) why **MUST** the Kamiyama material have a ratio of inorganic particle size to polymer particle size of only 1.1:1 to 20:1 as claimed by Appellant? In fact, given the huge, theoretically possible range of ratios for inorganic particle size to polymer particle size (0.004:1 to 300:1) it appears more probable that the ratios for inorganic particle size to polymer particle size in the proposed combination fall outside of Appellant's very narrow ratio range than within Appellant's very narrow ratio range.

Even if the inorganic suspension stabilizer of Kamiyama can be considered filler (which Appellants dispute), there is no explicit or inherent teaching or suggestion in the proposed combination that would necessarily lead to Appellants' claimed ratio of inorganic particle size to polymer particle size. Claims 18-24, 34 and 37-39 are patentable for at least this reason.

d) The huge, theoretically possible genus of inorganic particle size to polymer particle size ratios in the proposed combination does not make Appellant's narrowly claimed range of ratios obvious.

If a reference's disclosed range is so broad as to encompass a very large number of possible distinct compositions, this might present a situation analogous to the obviousness of a species when the prior art broadly discloses a genus. MPEP§2144.05(I). It is well established that the disclosure of a genus in the prior art is not necessarily a disclosure of every species that is a member of that genus. In re Baird, 16 F.3d 380, 382 (Fed. Cir. 1994). There may be many species encompassed within a genus that are not disclosed by a mere disclosure of the genus. Atofina v. Great Lakes Chem. Corp., 441 F.3d 991, 999 (Fed. Cir. 2006). A genus does not automatically make obvious every species therein. MPEP §2144.08.

Kamiyama and Hielscher Technology both lack any teaching or suggestion leading to any ratio of inorganic particle size to polymer particle size. Arguendo, if the inorganic suspension stabilizer of Kamiyama can be considered filler (which Appellants dispute); and if Hielscher Technology can disclose "standard silica" sizes for high shear mixing (which Appellants' also dispute); then the huge genus of theoretically possible ratios for inorganic particle size to polymer particle size (0.004:1 to 300:1) in the proposed combination does not anticipate or make obvious Appellants' narrow species of ratio of filler particle size to polymer particle size of 1.1:1 to 20:1. Claims 18-24, 34 and 39-41 are patentable for at least this reason.

e) There is neither suggestion nor motivation to modify the teachings of Kamiyama as proposed in the rejection.

". . . in cases involving new chemical compounds, it remains necessary to identify some reason that would have led a chemist to modify a known compound in a particular manner to establish prima facie obviousness of a new claimed compound." "While the KSR Court rejected a rigid application of the teaching, suggestion, or motivation ("TSM") test in an obviousness inquiry, the Court acknowledged the importance of identifying "a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does" in an obviousness determination. KSR 127 S. Ct. at 1731." Takeda Chem. Indus. v.

Alphapharm Pty., Ltd., 492 F.3d 1350, 1356 (Fed. Cir. 2007).

There is no teaching in Hielscher Technology that silica is useful as filler, or might be useful as filler, in the Kamiyama composition. There is no teaching in Hielscher Technology of any ratio of inorganic particle size to polymer particle size within any composition. The Office asserts:[11] "Since the [Hielscher Technology] product literature (abstract) clearly teach that the disclosed silica can be dispersed to form a dispersion with improved dispersion properties, it would have been obvious . . . to incorporate the particle size teachings of the [Hielscher Technology] product literature into Kamiyama et al. . . ." In actuality, the Hielscher Technology product literature states: "Typically silica is not well dispersed after wetting. . . . Ultrasonic processing has been proven to me [sic] more effective in dispersing of silica than other high-shear mixing methods. The picture shown below [figure reproduced in the present rejection] shows the typical result of ultrasonic dispersing of fumed silica in water." In sum, the "improved dispersion properties" referred to in the rejection are the result of an ultrasonic dispersing process not used in Kamiyama and NOT the silica particle sizes.

Kamiyama knows what filler is (see the disclosure therein at column 1, lines 12 and 24) and clearly teaches that silica in that composition, if used at all, is a suspension stabilizer and NOT as filler.

The proposed combination adds filler to the Kamiyama composition despite the explicit teaching of Kamiyama that the silica is used, if at all, as a suspension stabilizer; and despite the contrary definition of filler used in the chemical arts. The reason given in the Action as to why the skilled person would add filler to this composition is unsupported by Hielscher Technology. The Office reasoning does not meet the requirements for a *prima facie* obviousness rejection. Claims 18-24, 34 and 39-41 are patentable for at least this reason.

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[11] 10/27/2009 Office Action, page 4.

f) Kamiyama teaches against use of filler as proposed in the combination.

A reference that teaches away from a claimed invention does not provide the suggestion or motivation needed to anticipate or make obvious a claimed invention. In fact, the courts have stated that a reference that teaches away from a claimed invention is an indication of the nonobviousness of that invention. "A reference, however, must have been considered for all it taught, disclosures that diverged and taught away from the invention at hand as well as disclosures that pointed towards and taught the invention at hand." Ashland Oil, Inc. v. Delta resins & Refractories, Inc., 227 USPQ 657, 666 (Fed. Cir. 1985). "One important indicium of nonobviousness is 'teaching away' from the claimed invention by the prior art." In re Braat, 16 USPQ2d 1813, 1814 (Fed. Cir. 1990). The prior art reference must be considered in its entirety, including portions that would lead away from the claimed invention. See MPEP 2141.02. A *prima facie* case of obviousness of ranges may be rebutted by showing that the art, in any material respect, teaches away from the claimed invention. MPEP §2144.05(III). A "reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the Appellant." Winner v. Wang, 202 F.3d 1340 (Fed Cir. 2000).

As discussed above filler is a material added in large quantities to displace a more expensive material in a composition or change properties of the composition.

Silica (the "filler" proposed in the Office rejection) is a thickening additive and when used as filler will increase the viscosity of some compositions. See attached page from http://westmarine.com/webapp/wcs/stores/servlet/producte/10001/-1/10001/29011?.[12]

Kamiyama teaches at column 6, lines 17-23 that increasing composition viscosity will undesirably lead to particle size growth or gelling. Suspension stabilizers are used to prevent these undesirable effects. Silica used in large amounts as a filler in the manner proposed in the rejection would undesirably thicken the Kamiyama composition.

The proposed combination adds filler to the Kamiyama composition despite the explicit teaching of Kamiyama that the silica is used, if at all, as a suspension stabilizer and not a filler (under the definition of filler used in the chemical arts). The proposed combination does not meet the requirements for a *prima facie* obviousness rejection. Claims 18-24, 34 and 39-41 are patentable for at least this reason.

g) The proposed modification renders Kamiyama unsatisfactory.

If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. MPEP 2143.01, Rev. 2 May 2004, pp. 2100-131.

A filler is a material added in large quantities to displace a more expensive material in a composition or change properties of the composition. As discussed above, silica (the "filler" proposed in the Office rejection) is a thickening additive and when used as filler will increase the viscosity of some compositions.

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[12] Filed with Appellants' 6/30/2009 Response.

Kamiyama teaches at column 6, lines 17-23 that increasing composition viscosity will undesirably lead to particle size growth or gelling. Suspension stabilizers are used to prevent these undesirable effects. Silica used in large amounts as a filler in the manner proposed in the rejection would undesirably thicken the Kamiyama composition.

The proposed combination adds filler to the Kamiyama composition despite the explicit teaching of Kamiyama that the silica is used, if at all, as a suspension stabilizer; despite the contrary definition of filler as used in the chemical arts; and despite the undesirable thickening effect that would occur in the Kamiyama composition if silica was used as a filler. The proposed addition of silica filler would render the Kamiyama composition viscous, gelled and unsatisfactory. The proposed combination does not meet the requirements for a *prima facie* obviousness rejection. Claims 18-24, 34 and 39-41 are patentable for at least this reason.

h) The Board should withdraw the 35 U.S.C. §103(a) rejection of claims 18 and 20-24, 34 and 36-39.

The proposed combination does not explicitly disclose all of the features of Appellant's claims. Teachings within the proposed combination cannot certainly or necessarily or inevitably lead to Appellant's claims. In fact, it appears more probable that any ratio of suspension stabilizer or inorganic particle size:polymer particle size in the proposed combination or Kamiyama will be different that Appellant's claimed narrow ratio. Even if there is some teaching concerning ratio of inorganic particle size to polymer particle size to be gleaned from Kamiyama (a position that Appellants dispute) the huge genus of Kamiyama does not anticipate or make obvious Appellants' narrowly claimed species.

The Board has reversed rejections finding that all claim limitations were not present in the cited documents. Ex parte McCrossin, Appeal No. 2007-1796, 2007 WL 5084761, at *8 (B.P.A.I. Dec. 27, 2007) (obviousness rejection reversed since Examiner failed to provide "objective evidence" for "significant" claim limitation); Ex parte Parsel, Appeal No. 2007-2619, 2007 WL 4470094, at *4 (B.P.A.I. Dec. 19, 2007) ("Appellant's argument that [cited prior art] does not disclose or suggest the [claimed] range limitation has persuaded us that the Examiner erred.").

Appellants submit that based on the above, the Examiner's rejection of claims 18-24, 34 and 39-41 under 35 U.S.C. §103(a) cannot stand and the Board should reverse the rejection and pass these claims to issue.

3) Claims 19 and 40 are patentable for additional reasons.

Claim 19 recites: "The filler-containing polymer dispersion as claimed in claim 18, wherein the synthetic organic polymer particles have a diameter (d50) of 0.03 to 0.5 µm." Claim 40 includes a similar feature.

On 10/27/2009 the Office asserted[13]: "Further, according to Kamiyama et al. (Fig. 3-6), the polymer particles of Kamiyama et al. ranges from 1 to about 20 microns, 0.5 to 50 microns (col. 6, line 1-14), or higher (col. 9, line 28-36; col. 10, line 42 to col. 12, line 66)." **This Office position is NOT supported by Kamiyama.**

Kamiyama column 6, lines 1-14 discloses polymer particles may be not larger than 30 microns and in the range of 2-3 microns to 30 microns NOT 0.5 to 50 microns as asserted.

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[13] 10/27/2009 Office Action, page 3.

Kamiyama column 9, lines 28-36 does not disclose any definite polymer particle size.

Kamiyama column 10, line 42 to column 11, line 21 does not disclose any definite particle size. The Examples from column 11, line 22 to column 12, line 66 disclose preparation of polymer particles having median sizes of 5.2 microns and 4.8 microns.

Kamiyama figures 3-6 are graphs showing particle size. The graphs have numerals for 0, 10 and 20 microns and possibly indicia for 3.3, 6.6, 13.3 and 16.6 microns. At The graphs are simply not accurate below about 3 microns. Further, the drawings are illustrative and do not define ranges outside of the ranges disclosed in the Kamiyama text.[14] At best, the graphs show NO particles (0%) below about 1 micron.

The 12/31/2009 Advisory Action now shifts from the previous position to the background text of Kamiyama to support the rejection. The rationale as best understood is that (1) the emulsion polymerization method and particle sizes needed for this rejection are no longer in the body of Kamiyama but rather only in the background text (a background distinguished by Kamiyama as providing different and inferior results to the Kamiyama invention); and (2) that this disparaged background process and particles can further be combined with selected portions of the inventive and different Kamiyama suspension polymerization method; and (3) that the emulsion polymerization components must further still not only use filler but also use the particle sizes disclosed in Hielscher (even though Kamiyama is silent and the Advisory Action admits that Hielscher is limited to ultrasonic dispersions and NOT the high shear dispersions used in Kamiyama). This combination is woefully lacking in detail, enablement, motivation and still fails to find all of Appellants' claimed features.

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[14] Ordinarily drawings which accompany an application for a patent are merely illustrative of the principles embodied in the alleged invention claimed therein and do not define the precise proportions of elements relied upon to endow the claims with patentability. In re Olson, 41 C.C.P.A. 871, 874 (C.C.P.A. 1954). See also In re Betz, 35 C.C.P.A. (Patents) 1033, 166 F.(2d) 831, 77 USPQ 162; Wasberg v. Ditchfield, 33 C.C.P.A. (Patents) 1099, 155 F.(2d) 408, 69 USPQ 538.

The Board should reverse the rejection of claims 19 and 40 and pass these claims to issue.

4) Claims 24 and 38 are patentable for additional reasons.

Claim 24 recites in one pertinent part: "The filler-containing polymer dispersion as claimed in claim 18 comprising: . . . 5 to 55% by weight of filler particles . . ." Claim 38 includes similar features.

The Office asserts that the silica powder suspension stabilizer of Kamiyama is Appellants' recited filler. The Office does not indicate where the art of record discloses the use of 5 to 55% by weight of silica powder.

Kamiyama teaches at column 6, lines 17-23 that increasing composition viscosity will undesirably lead to particle size growth or gelling. Suspension stabilizers are used to prevent these undesirable effects. The Office does not explain why use of 5 to 55% by weight of silica powder in the composition of Kamiyama would not lead to undesirable viscosity increases in that composition as taught by Kamiyama.

Claims 24 and 38 are patentable for at least this additional reason.

5) Claims 25-33 and 35 are patentable for additional reasons.

Claim 25 recites:

> The process for the production of a filler-containing polymer dispersion, which comprises: emulsion polymerizing at least one radical-polymerizable monomer in an aqueous phase using a polymerization initiator, the aqueous phase containing filler particles of at least one dispersed filler with a particle size (d50) of 0.01 to 0.5 μm and at least one water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15 whereby a dispersion comprising filler particles and polymer particles is formed.

Claims 26-33 and 35 depend from claim 25.

a) Kamiyama is not enabled to be prior art to the emulsion polymerization method of Appellant's claims 25-33 and 35.

To anticipate a reference must sufficiently describe the claimed invention to place the public in possession of it. Paperless Accounting, Inc. v. Bay Area Rapid Transit System, 804 F.2d 659, 231 USPQ 649, 653 (Fed. Cir. 1986). A non-enabling reference may qualify as prior art for the purposes of determining obviousness under 35 U.S.C. §103, but only for what is disclosed in that reference. Symbol Technologies Inc. v. Opticon Inc., 935 F.2d 1569, 1578 (Fed. Cir. 1991).

As discussed above, Kamiyama discloses only specific suspension polymerization methods that are taught to provide improved polymer particulates over previously known methods, including emulsion polymerization. In fact, Kamiyama teaches away from emulsion polymerization. The entire disclosure of emulsion polymerization methods and compositions in Kamiyama is at column 1, lines 19-31, which states:

> The importance of powder making technology which takes advantage of the various functions of particles per se is increasingly recognized these days. Among the particles produced by this technology are gap retainers, slip imparting agents, functional carriers, monodispersed particles having surface activity, standard particles, toners, and functional fillers that control the fluidity and gloss characteristics of paints. In order to produce these particles by polymerization, emulsion polymerization is used most commonly today. In speciality applications, other methods of polymerization are employed, such as soap-free polymerization, dispersion polymerization, seed polymerization and swelling polymerization.

and at column 1, lines 32-42, which states:

> However, these methods of polymerization have several defects. For example, considerable difficulty is involved in removing non-negligible impurities such as emulsifiers. Second, the size of particles that can be produced is limited. Third, the production cost is exorbitant. Fourth, these methods are too complex to be suitable for large-scale production. Particles having a narrow size distribution are in most cases produced by emulsion polymerization but the size of particles that can be produced by this method is only about 1 μm at maximum and producing larger particles is extremely difficult.

This disclosure in Kamiyama fails to disclose at least an emulsion polymerizing at least one radical-polymerizable monomer in an aqueous phase using a polymerization initiator; the aqueous phase containing filler particles of at least one dispersed filler; the filler particles having a particle size (d50) of 0.01 to 0.5 μm; at least one water-soluble organic polymer with a molecular weight of more than 600 and an HLB value of more than 15 and the dispersion comprising filler particles and polymer particles is formed. Kamiyama is not enabled to be prior art to Appellants' claim 25. Claims 25-33 and 35 are patentable for at least this reason.

b) The proposed combination does not teach or suggest Appellants' claimed emulsion polymerization method.

Hielscher Technology is devoid of any teaching or suggestion of any polymerization mechanism. As discussed above, Kamiyama discloses only specific suspension polymerization methods that are taught to provide improved polymer particulates over previously known methods, including emulsion polymerization. In fact, Kamiyama teaches away from emulsion polymerization. There is no disclosure that the Kamiyama composition can be made by emulsion polymerization. There is no enabled disclosure of Appellants' emulsion polymerization process. Claims 25-33 and 35 are patentable for at least this reason.

c) The Office rejection ignores the explicit language in claim 25 requiring the step of emulsion polymerizing.[15]

On 10/27/2009 the Office stated, with underlining added:[16] "Appellants argue that Kamiyama repeatedly limits the disclosure to one suspension polymerization, which can be considered as a 'teach away' reference to the instantly claimed invention. However the examiner disagrees because the invention as claimed relates to filler-containing polymer dispersion product, where the method for producing the dispersion product is not supported by the claims as written." Based on this record statement the present rejection was imposed without considering the features of claim 25.

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[15] Appellants argument that claim 25 is directed to emulsion polymerization and that Kamiyama does not teach or suggest such method goes back to their previous Appeal Brief (page 19) filed on 9/6/2008; their 6/30/2009 response (page 19) after prosecution reopened; and their 11/20/2009 telephone interview with Examiner Cheung.

[16] 10/27/2009 Office Action, page 5, point 5, lines 2-7.

The 12/31/2009 Advisory Action on page 2 now shifts to the background text of Kamiyama to try and find support for emulsion polymerization in the rejection. As discussed above, this combination lacks detail, enablement and motivation and fails to find all of Appellants' claimed features. Further, Kamiyama teaches away from this position, disclosing that emulsion polymerization and suspension polymerization have different problems and provide different products (column 1, lines 38-54) and that the specific Kamiyama suspension polymerization method solves these problems (column 2, lines 32-55). Claims 25-33 and 35 are patentable for at least this reason.

d) The proposed combination of Kamiyama and Hielscher Technology does not teach or suggest filler with a particle size (d50) of 0.01 to 0.5 micrometers in the Kamiyama composition.

The Office admits that Kamiyama does not disclose any filler particle size.[17] The Office admits that Hielscher Technology discloses: "standard silica that can have particle sizes range from 2 microns to 600 microns, with median particle size of about 250 microns." **Thus, the Office previously admitted that the record does not teach or suggest any composition comprising filler with a particle size (d50) of 0.01 to 0.5 micrometers.**

The 12/31/2009 Advisory Action now asserts that this silica size range can be found in the "after sonication" range of Hielscher.[18] The Advisory Action fails to explain why the emulsion polymerization methods glancingly mentioned in Kamiyama use filler at all. The Advisory Action fails to explain why the size range of particles after

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[17] 10/27/2009 Office Action, pages 3-4.

[18] Hielscher, page 2, top Particle Size Distribution graph, left side.